# *The Realities of Successful Project Management*
# *Project Management Challenge 2008*
# *Daytona Beach, Florida*

Phil Sabelhaus

JWST Project Manager

February 27, 2008

# *Who am I?*

- Currently the James Webb Space Telescope (JWST) Project Manager
  - Graduated from the University of Maryland in 1978
  - Over 25 years of experience in the Aerospace business
    - Mostly at GSFC/NASA and as a manager (as apposed to engineering)
- Previous project or program management positions:
  - Total Ozone Mapping Spectrometer (TOMS) Project Manager
  - Geostationary Operational Environmental Satellite (GOES) Deputy Project Manager
  - Landsat 7 Project Manager
  - Earth Observing System (EOS) Deputy Program Manager plus
    - Aura Project Manager
    - Vegetation Canopy Lidar (VCL) Project Manager
    - Aqua Project Manager
  - Earth Observing System (EOS) Program Manager

# *Project Management Objective*

- Achieve mission success while looking for opportunities to share the blame for any additional required time and money
  - Share blame on factors not under the project's control, ie. budget cuts, launch vehicles, ground system, requirement changes, etc.
  - Ask for more money and time when you first take over a project, not after you have been there for awhile
- "The difference between a successful project manager and an unsuccessful project manager is recognizing and exploiting opportunity."
- "It's better to be lucky than good."
- It's even better to be lucky and good.  You make your own luck by being good

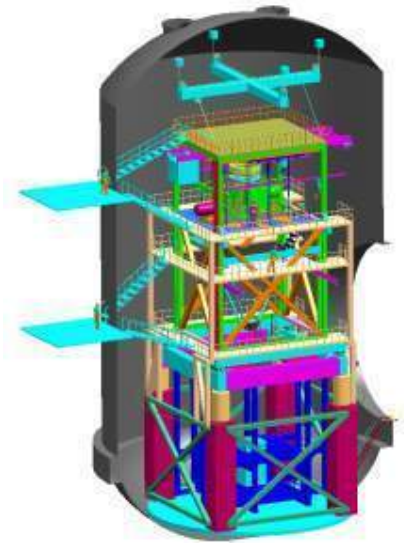

# *Obvious Project Management Tools*

- Organization with clear lines of authority and accountability
- De-scope plan as a function of project life cycle
- Critical path schedule with identified and budgeted schedule contingency
- Grass roots budget with adequate properly phased contingency
- Risk management process that is used.  Process does not have to be complicated

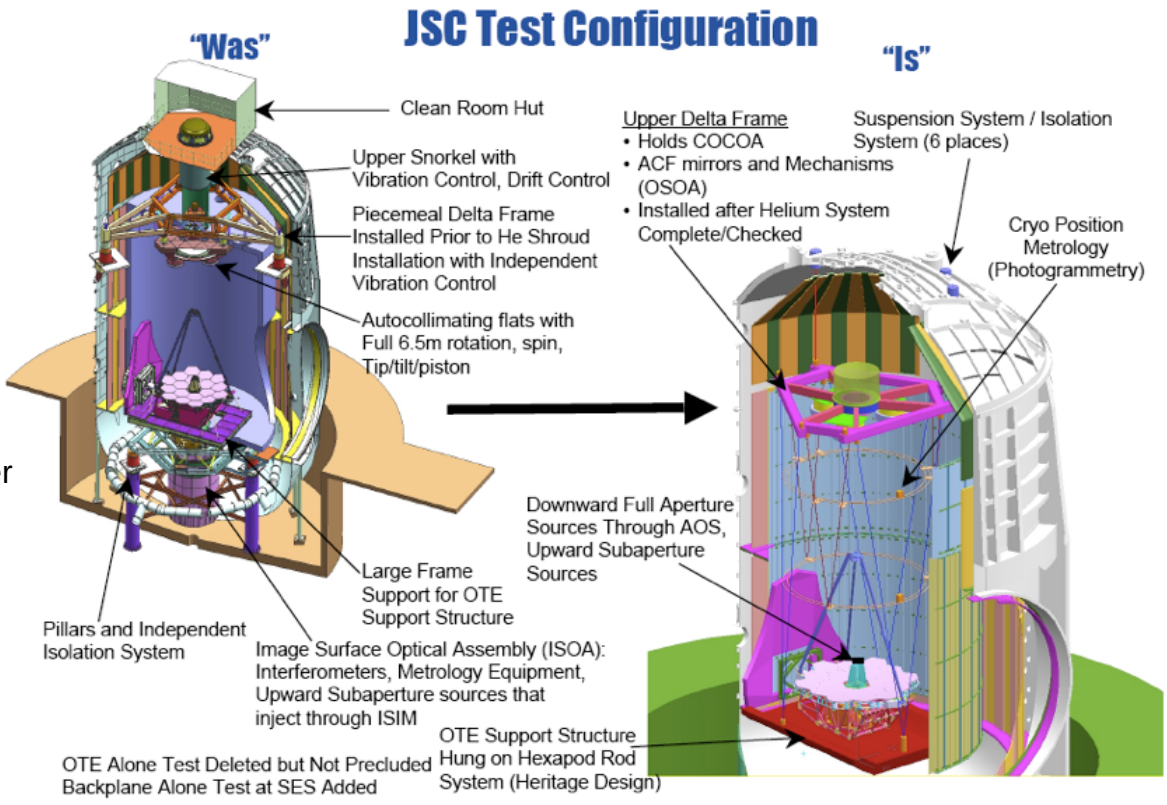
# My Projects

- TOMS-EP
  - Pegasus launch failures delayed the launch by 2 years. Some of that time was used to better train the FOT and fix latent satellite problems. We didn't need the 2 years, but a couple of months helped
- Landsat 7
  - ETM+ delays blamed on heritage design inherited from the Air Force. Detailed example of using schedule work arounds to reduce risk and minimize launch delays
- Aura
  - EOS Program office needed the Aura project's launch vehicle money for another project in FY01. The Aura project needed more time for instrument development. The program office got $12M loaned to them and the Aura project got 6 months of schedule slip and the loaned money paid back with interest. Everyone was happy
- VCL
  - Nothing seemed to work, the project was eventually cancelled due to immature laser technology
- Aqua
  - Asked for and received 5 months of schedule slip and $22M shortly after taking over the project. Used time to move up fault management testing while fixing latent problems with the satellite hardware. This reduced the over all risk to meeting the new LRD. More time should become available due to the missions in front slipping the Delta II manifest
- JWST
  - Used projected cost growth as the catalyst to simplify the I&T program. The technical team was able to come up with creative solutions to achieve almost all of the original testing requirements while reducing hardware interdependencies and moving the need date of some critical path hardware and money to the right

# Evolution of JWST Testing Approach



"Cup-down" test configuration within Johnson Space Flight Center (JSC) cryogenic test chamber



# *Landsat 7 Example*

- The Landsat 7 launch was only delayed by 11 months from May 1998 to April 1999 even though the delivery of the only instrument on the satellite was delayed by 2 years due to a series of design heritage and workmanship problems that were not uncovered until system level testing
  - Satellite was ready for launch in February 1999
- The Landsat 7 Program Plan was highly dependent on a heritage 'build to print' instrument for management approach, budget and schedule. The project used a 'light touch' in managing the instrument contractor (SBRS) in the early stages of development as part of a new way of doing business
  - The Landsat 6/ETM had been commercially procured and its development problems were not really understood. Landsat 6 never reached orbit and ended up in the drink. The last significant NASA involvement was on the Landsat 5/TM which was launched in 1984

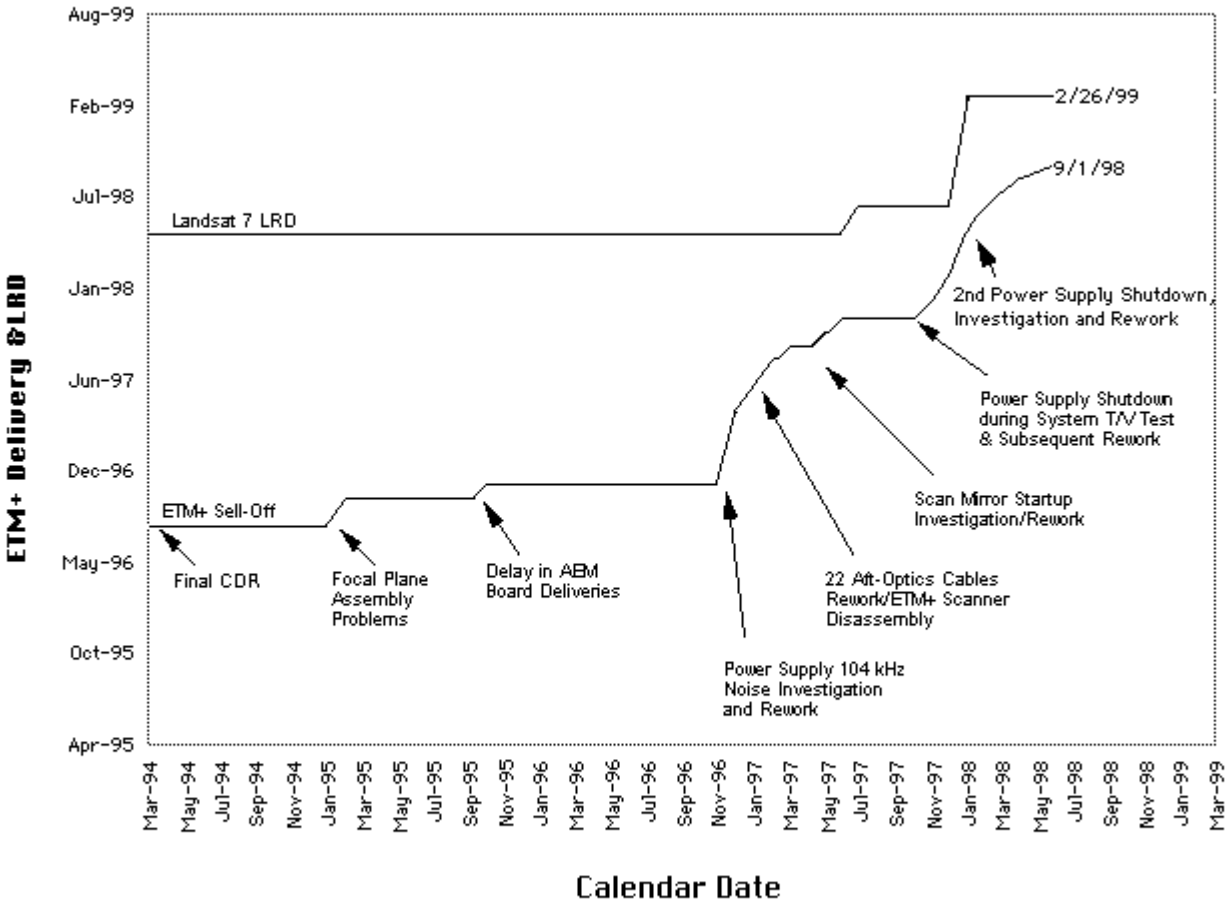
# *Landsat 7 Example (Continued)*

- NASA took over the Landsat 7 program from the Air Force after the Enhanced Thematic Mapper Plus (ETM+) CDR
- The Landsat 6 launch failure was attributed to the satellite's propulsion system and the project's early energy was focused on LMMS

# *Landsat 7 Adjusted Development Approach*

- Due to the ETM+ problems and resultant delivery delays, the project developed an approach to test the available flight hardware and software as early and as often as possible
  - Satellite test flow altered several times to retire risk and minimize the schedule impacts of the ETM+ late delivery
    - Spacecraft Comprehensive Performance Tests (CPT's), phase 1 EMI/EMC and thermal vacuum, sine vibration, acoustics were initially performed with various combinations of ETM+ flight and mass model/electrical simulator hardware
    - ETM+ installed early on satellite to check interfaces and generate data to check out the ground system
  - System test programs for both the ETM+ and satellite were ***not*** compromised due to the use of heritage designs
  - Testing approach was effective in uncovering problems early

# ETM+ Schedule Erosion



# ETM+ Schedule Slips

- ETM+ delivery slipped (~24 months) from August 1996 to late August 1998 due to a combination of workmanship and heritage design problems
  - Workmanship problems:
    - reworked poorly manufactured optical cavity video cables
    - reworked Main Electronics Module (MEM) power supply 2A to remove 52 kHz noise
    - repaired bad solder joint on band 7 channel 13 detector amplifier
  - Heritage design problems:
    - power supply failures in the instrument level thermal vacuum test
    - low pass electronic filters and ground system software algorithm required to remove heritage power supply 104 kHz noise in pan band
    - reworked scan mirror to eliminate start up problems
    - reworked both power supplies to remove short/potential shorts
    - using unreliable Landsat 4/5 heritage test equipment
    - lost key SBRS “heritage” people due threaten plant closure

# ETM+ Power Supply Failures

- ETM+ experienced two separate power supply failures early during the instrument thermal vacuum testing
  - Tiger team made up of GSFC, SBRS, LMMS and Aerospace Corporation experts was formed to spearhead the recovery effort
  - Power supplies were not thermal vacuum tested at the unit level
  - Problem was isolated to switching diodes with poor ‘reverse recovery time’ (RRT) performance. Lack of air in T/V test was enough to cause failures
  - Part change from previous units due to Air Force imposed Grade 1 parts requirement. RRT is not a mil spec measured parameter. Parts appeared to be better
  - New parts with acceptable RRT performance were found, tested and installed in the power supplies. 108 diodes had to be replaced in each power supply
  - Power supplies have operated successfully on obit for over two years

# L7 Lessons Learned

- Whenever NASA takes over an ‘in progress’ program like Landsat 7, a detailed critical design system review of all elements should be held as part of formulating the baseline
  - ETM+ did not have a GSFC chaired review until the Pre-Environmental Review (PER) was held in the fall of 1997
- Be careful with the promise of heritage. Heritage that is 20 years old and without the original people is not heritage
  - 20 year old designs really can not be reproduced. At a minimum, electronic parts are not available, processes have changed and the people who put it together are no longer around
  - Change in application of heritage designs were not completely reanalyzed
  - Since ETM/L6 was a commercial buy, a gap existed in NASA’s understanding of the heritage design
- Don’t comprise the test program when using hardware and software based on heritage designs

# Final Thoughts

- Get good people and let them do their jobs
- Build good chemistry between all contractor and government team members. This ensures that everyone is a stakeholder in the success of the mission
- Never forget who is ultimately accountable
- Attack your problems early and aggressively. Don't put your head in the sand and hope things will get better. They don't!
- Always tell the truth, but do it at the right moment. Give your problems a little time to age. Follow the 24-48 hour gestation rule
- Don't constantly ask for direction or guidance. If you do, you will get it. It's your project, manage it
- Communicate communicate communicate. Can't over communicate
- A test is worth a thousand analyses. Get operating time on the hardware and software. Test as you fly. Don't forget to test with the ground system
- Take care of yourself. Nobody else will. This means eat well and exercise. Project management is more of a marathon than a sprint
- The reward for doing a good job (at least at GSFC) is the opportunity to do it again
- Above all else "Mission Success". Make the right technical decisions. This achieves mission safety